LETTERS TO THE EDITOR.

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Atomic Energy.

REFERRING to the notice of my recent Trueman Wood lecture on p. 420 of NATURE of December 25 last, let me explain that I admitted that we could not at present tap or utilise intra-atomic energy except what is given us spontaneously. But we may claim to be utilising intra-atomic properties, since without some kind of disintegration the right kind of projectiles would not be available. I say clearly in the lecture "it is atomic properties rather than atomic energy that are at present being utilised" in wireless telephony.

Furthermore, although the excitation of healthy retinal nerves is primarily dependent on the energy of incident light, yet the action is as if the atoms of a retinal substance acted as accumulators, storing up an æther disturbance of quite unphysiological frequency until a quantum has been collected, when a stimulating projectile is liberated. If anything like this happens, the energy actually utilised is atomic energy; for if that had no existence, the light-waves would be powerless. There may be pathological cases where optic-nerve stimulus is independent of received luminous energy, but that is a highly undesirable state of affairs.

OLIVER J. LODGE.

Metamorphosis of Axolotl caused by Thyroid-feeding.

THE fact that a diet of mammalian thyroid will induce frog-tadpoles to metamorphose precociously into the adult form is now well established. It is of some interest to find that this diet produces a similar effect in a form which usually does not metamorphose —the Axolotl. This is the larva of a salamander known as Amblystoma, but is remarkable in being neotenic, *i.e.* it normally fails to metamorphose, and attains full size and sexual maturity while keeping its larval characters. Chief among these are the external gills and the fin along the back and both borders of the tail, but the adult also differs from the larva in colour, in shape of head, in the development of eyes and eyelids, in the rounded form of the tail, and, of course, in the use of its limbs for progression on land.

Marie von Chauvin in Germany (*Zeitschr. f. Wiss. Zool.*, vol. xxvii., 1877, and vol. xli., 1885) and E. G. Boulenger in this country (Proc. Zool. Soc., 1913 (2)) have succeeded in getting Axolotls to assume the adult form by forcing them to breathe air, either by keeping them in damp moss or in a gradually diminishing quantity of shallow water.

In conjunction with Mr. D. F. Lenev, I have been trying the effect of thyroid diet on Axolotls. Two young specimens, 11·5 cm. and 12·7 cm. long, and therefore presumably between six and twelve months old, were kept in a tank at an average temperature of 15°–16° C. in a depth of water (more than 2 in.) considerably greater than that needed to induce air-breathing. They were fed on ox thyroid, at first three times, and later twice, a week.

The thyroid diet began on November 30 last. On December 15 distinct alterations were visible in colour and in resorption of gills and fin, and on December 17 the stage which is critical in metamorphosis induced by air-breathing (see Boulenger's paper) had been passed, the animals being in Boulenger's stage 6, with only vestiges of gills and fin. On December 19 the next or penultimate stage, with scarcely a trace of larval characters, was reached. The larger specimen, the metamorphosis of which was slightly more advanced, had climbed out of the water up a platform provided for the purpose, and its skin was as dry as an ordinary salamander's. When placed on the table they both walked well, thus differing markedly from the larva, which cannot use its legs efficiently if placed on land. Curiously enough, on the succeeding day the larger animal had returned to the water, where it remained until December 23. It then again left the water of its own accord, and up to the time of writing (December 24) has remained in air. Two other specimens of similar size, fed on worms and kept in shallow water, according to Boulenger's method, have so far shown only minimal changes.

Two points are of special interest. First, the time of metamorphosis—just over three weeks—is much shorter than any previously recorded. Boulenger's larvæ took from twelve to sixteen weeks, Marie von Chauvin's from seven to forty weeks. Secondly, the "critical stage" in the metamorphosis was reached apparently without the animals breathing air at all; *i.e.* two entirely different causes, forced air-breathing and a thyroid diet, can produce the same result—metamorphosis. It was not until December 19 that they were observed to come to the surface for air; and even after that, although possessing no functional gills, they spent much time at the bottom of the water, only occasionally rising to float suspended close below the surface with limbs outspread, after the fashion of newts.

Many interesting problems present themselves, which it is hoped to work out as opportunity offers. Meanwhile, this note is published in the hope that others who possess Axolotls will repeat and develop experiments along these lines. I should be glad to enter into correspondence with anyone intending to work on the subject, with the view of preventing useless overlapping in the working out of the problems that arise; and, further, I should be very grateful if anyone possessing Axolotls, whether young or old, would give me the opportunity of purchasing some, as they are at present very difficult to obtain in the market.

JULIAN S. HUXLEY.

New College, Oxford, December 24.

The Hibernation of the House-fly.

M. DE SEGUY's discovery of larvæ of *Musca domestica* in the bodies of snails, Dr. J. C. Gahan's observations thereon in the *Times*, and the note in NATURE of December 18 last are very interesting to biologists, but it is most improbable that a winter crusade against the Helicidæ would have any appreciable effect in diminishing the summer swarms of flies.

I am led to this conclusion by circumstances under my immediate observation. Round my house is a large flower-garden in which I work constantly at all seasons, desperately worried in summer by legions of house-flies. In the course of forty years I have never come across one of the larger Helicidæ in this garden; and my head gardener, a very intelligent man and a good observer, assures me that in thirty years he has never seen one in the kitchen-garden, which is distant half a mile from the flower-garden. Slugs abound in both, but the only one of the Helicidæ that is found is a very small species with a thin, flattened shell (? *Helix cellaria*, Müller) and a body too small to accommodate the larva of a house-fly. It is also the reverse of abundant. There must,

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therefore, be other kinds of *nidus* to harbour the larvæ of *Musca domestica* through the winter.

Monreith. HERBERT MAXWELL.

The Magnetic Storm of August 11–12, 1919.

THE Kodaikanal Observatory magnetographs recorded the "sudden commencement" of this storm on August 11 at 6h. 58m. G.M.T., horizontal force showing an instantaneous rise of 149γ and vertical force about 35γ, while the declination magnet was deflected about 1′ towards west. I have measured the three traces, and, after making due allowance for the errors affecting the hour-marks, the following values were obtained:—

	h.	m.
Horizontal force	6	58·0
Vertical force	6	58·7
Declination	6	57·9

Greater weight may be given to the declination result because of the more sharply defined hour-marks in this trace.

It is of interest to compare this result with the times recorded in England in view of the fact that at Kodaikanal the sun at 6h. 58m. G.M.T. was barely three minutes past meridian passage and only 5° north of the zenith. In other words, this observatory was almost at the centre of the earth's disc as seen from the sun, and it might be supposed that the disturbance would have been recorded here earlier than at other places if it is directly due to emanations from the sun.

Apparently the sudden commencement was recorded at Kew "at about 7h. G.M.T.," and at Stonyhurst at 6h. 50m., while at Eskdalemuir the time is given definitely as 6h. 58m., in exact agreement with my result (NATURE, vol. ciii., pp. 483, 505 and 506).

It seems probable that the impulse is simultaneous over the earth to within a fraction of a minute, but it would be interesting to know the limits of error to which the above times are subject, and particularly whether allowance has been made for the rather large error which may be produced by the mechanism for cutting off the light from the sensitive paper at each hour. J. EVERSHED.

Kodaikanal, S. India, November 25.

Deflection of Light during a Solar Eclipse.

DURING a total eclipse of the sun there will be, as I suppose, an increase of density of the air at the central portion of the shadow. If we imagine the normal atmosphere removed, we are left with a residual atmosphere the refraction effects of which will be changes in the normal refraction effects. The whole point is whether, on reasonable suppositions, this residual atmosphere can produce refraction effects of the order of the observed effects that have been attributed to the gravitational field of the sun.

Let us suppose with Prof. Eddington that the portion of this residual atmosphere concerned corresponding to a star near the edge of the sun's disc has a radius of about 150 yards, and let the index of refraction of the residual atmosphere at the central part be μ_2, and that at the circumference μ_1. Then, as I have shown, the displacement will be accounted for if

$$\mu_2=\mu_1\left(1+\frac{7}{10^8}\right).$$

Assuming that the change of density depends only on change of temperature, we have

$$\frac{\rho_2}{\rho_1}=\frac{\theta_2}{\theta_1}=\frac{\mu_2-1}{\mu_1-1},$$

where ρ_2, ρ_1, θ_2, θ_1 are the increases of density and falls of temperature at the centre and circumference. Thus we have, approximately,

$$\frac{\theta_2-\theta_1}{\theta_2}=\frac{7}{10^8(\mu_2-1)};\quad \frac{\theta_2-\theta_1}{\theta_1}=\frac{7}{10^8(\mu_1-1)}.$$

We must now make some assumption as to the gradient of temperature, and this is a very important point. It would not, I think, be right to make it uniform or approximately uniform throughout a distance of 150 miles. We will assume that in a distance of 150 yards the increase of temperature is 1/100th part of θ_2. This does not seem to be unreasonable.

We then have $\mu_2=1{\cdot}000007$ for the index of refraction of the residual atmosphere at the centre, corresponding to a lowering of temperature of 6·28° C. at the centre and of 6·22° C. at a distance of 150 yards. If we assume that the increase of temperature at a distance of 150 yards is 1/10th of θ_2, we get the fall at the centre 0·63° C. and that at 150 yards' distance 0·57° C. It will be seen that the greater $\frac{\theta_2-\theta_1}{\theta_2}$, the smaller is the necessary fall of temperature at the centre. ALEXR. ANDERSON.

University College, Galway, December 28.

Entente Scientific Literature in Central Europe during the War.

I WAS much interested in reading Prof. Brauner's letter from Prague in NATURE of December 11. Like Prof. Brauner, I was unable to obtain NATURE during the first two years of the war, and I fully appreciate his joy on obtaining your invaluable journal again, after an interval of more than five years.

Prof. Brauner states that from July 30, 1914, "the Austrian Government prohibited for more than four years the circulation of anything printed in England as a punishment for the regard which, especially during the war, we [the Czechs] have always had for your country."

This statement is misleading, for "enemy" periodicals were withheld from the whole of the Austrian Empire, and not from the Bohemians alone. Prof. Brauner is apparently unaware of the fact that, from 1916 onwards, it was possible for institutes of the Austrian universities and technical high schools to obtain scientific periodicals and publications from Entente countries. The enactment which made this possible did not appear to be generally known, but I am aware of two institutions at least, which made application for, and obtained from the Austrian Foreign Office, the necessary permission; and in neither instance was any difficulty experienced.

The Radium Institute of Vienna was one of the institutions concerned, although at that time several Poles (one of them a Russian subject) and the writer of this letter were working there. What is more, the Austrian Foreign Office was not unaware of this "quasi-international" character of the Radium Institute!

Books were also obtainable, and I know of several men of science of Vienna, Budapest, and even of Prague, who were granted permission and obtained books from France and England through neutral countries.

A few months before the armistice I remember sitting in a Viennese restaurant at the same table as a gentleman, who was voraciously devouring the contents of the *Sketch* and the *Illustrated London News*. To judge from his frequent unsuppressed laughter, one would have thought he was scanning the pages of *Punch*. Not having seen these periodicals for nearly five years, my interest and curiosity were aroused, and I asked this gentleman's permission to

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